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GEORGE HUNTINGTON WILLIAMS.

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As our thoughts turn to George Huntington Williams and we endeavor to express in some fitting form our appreciation of his character as a man and of his ability as a teacher and investigator, we are embarrassed by the sense of our bereavement at his death and of our bewilderment at those inscrutable laws that sometimes deprive us of what we hold best. It would be impossible for one who enjoyed the intimate friendship of such a nature as George Williams possessed to approach his memory by any other avenue than that of the affections, or to recite the achievements of his brilliant mental activities without first recalling those amiable traits that won him a place in the hearts of all his associates.

Gifted with the grace of personal attractiveness that commended him to the favor of new friends and in no way belied his disposition, he was also endowed with a ready adaptability to the conditions and interests of those with whom he was brought in contact, which was greatly enhanced by that happy faculty of letting others share his own interests and of considering them both worthy of his confidence and capable of entering into his pleasures and pursuits. These fundamental elements of good fellowship distinguished him to a marked degree. But he was more than genial; the buoyancy of his spirit which kept him company through periods of anxiety, making him hopeful in adversity, carried him at other times to heights of enthusiasm. The sanguine expectations and superlative qualities that sprang

into being at the magic touch of his unrestrained enthusiasm were irresistible. This quality of his nature contributed very largely to the success of his intellectual labors, and to the inspiring influence he exerted over his pupils. More than this, it enabled him to carry forward cheerfully the plan of his successful career against the early discouragement of those in authority over him, who subsequently recognized his ability and heartily coöperated to enlarge his opportunities.

One recalls with delight the vivacity and enthusiasm with which he disclosed some new observation, or unfolded schemes that opened up alluring vistas of possible research. But happier yet must always remain the recollection of George Williams as the historian of his own varied experiences. Times without number have we been carried away in merriment over the narration of his last humorous adventure until it seemed that all the incidents of his life must have worn the comic masque. His sense of humor was keen and never deserted him. By it ordinary events became amusing, and the more notable ones ludicrous. Whether his experience was in the class room or the study, dining room or nursery, some one or some thing furnished the text for a humorous anecdote. His excursions often brought him into laughable situations, and his more considerable expeditions became adventures alive with mirth or with ridiculous incidents.

But while stranger and friend alike paid tribute to his humor, his power of interpretation did not transgress the bounds of fairness, or expose its subjects to unjust ridicule. It lacked the sting of satire, and reflected the nobler characteristics of his nature. For above all other traits there shone the strong light of his unselfishness, raised into prominence by a spirit destitute of jealousy. Often did he prove by actions more than words his freedom from jealousy; his generous treatment of his students in their work; the helpful elaboration of their ideas, or of their plans; his successful navigation of those dangerous straits that separate the provinces of director and worker, of principal and assistant—waters in which so many craft become disabled, so many undertakings are hopelessly wrecked; his magnanimous

conduct toward his junior associate, whose advancement he earnestly advocated and materially hastened, and between whom and himself there always existed the closest affiliation and heartiest concord. And when, about to venture upon untried ground, the present writer sought his friend's advice, he found a generous counselor, one ever ready to communicate ideas, observations, and valued knowledge, who seemed incapable of secreting for some fancied gain anything that might benefit another. But higher yet must be recorded the purity of his life—his honor without reproach; his affections above suspicion.

Turning to his career as teacher and investigator we have first to note those faculties he happily inherited, which showing themselves from time to time during his early development at last became his strength and power. Among these was a great love for books, his frequent companions when a child. He was not only fond of studying them, but attempted making them, and soon developed correct habits of reading—close observation and discriminating analysis. These, combined with a good memory, also discriminative, proved invaluable aids to his success as a teacher, as well as to the completeness of his literary work, in which fullness of bibliography and strength of historical treatment are characteristic features.

He had also a faculty for acquiring languages that not only made him proficient in German and French, and well versed in Latin and Greek, but gave him a command over English which was evident in his writings and even more so in his speech. His conversation was fluent, and his ability to express his ideas in a clear, forcible manner rendered him an excellent lecturer and an attractive speaker. His skill in drawing and illumination developed during his school days, and turned his thoughts toward architecture, his choice of professions at the time of his entering college at eighteen. This talent served him well in after life, and contributed no little to his descriptive powers. A healthy inquisitiveness and the habit of close observation supplied the necessary elements of an original investigator, who

needed only an introduction to some of the many fascinating and alluring problems of Nature to become a zealous searcher after her hidden laws. He was the fortunate possessor of good judgment and a logical reason, and exhibited an energy that was constantly taxing his physical endurance.

With this endowment he entered Amherst College, and in time became attracted toward geology, remaining after graduation to pursue its study with Professor Emerson; then to Europe where he visited regions that had become geologically classic; settling in Heidelberg to devote himself to microscopical petrography under Professor Rosenbusch; acquiring at the same time a knowledge of crystallography and mineralogy. Graduating from Heidelberg in 1882, he returned to this country to find an opening for his stored-up energies in the Johns Hopkins University, where he undertook the labors of an Associate in 1883, being made Associate Professor in 1885. From this time on he led his dual life of teacher and investigator, apparently as eager to pursue the one line of activity as he was to carry on the other. And while they maintained the closest relationship to one another, proceeding conjointly, they may without violence be considered separately.

As a teacher he was eminently successful, judged by the interest taken in his courses, and by the character of the students who have graduated in his department, and who now occupy honorable positions, both in the faculties of universities and on the staffs of geological surveys. His methods were advanced and rational. The liberal use of laboratory practice and frequent excursions into the surrounding country brought his pupils in contact with problems as they exist in Nature. And the actual investigations they were themselves able to carry on under his direction rendered them not merely hearers of his words but doers of them; acquiring experience and self-reliance that enabled them to enter at once upon new fields of geological activity.

His influence as a teacher was not limited to his classes, but reached a much larger audience through the medium of his

writings ; whether in advocacy of the intimate connection between crystallography, physics, and chemistry ; or in proclaiming the achievements of microscopical research in the realm of geology ; or in the substantial aid to the study of crystallography which he has bequeathed us in his text-book on the Elements of Crystallography. His natural impulse to disseminate knowledge showed itself in the many reviews and notices of other works, which were thus brought to the attention of a wider circle of readers. His last writings were in connection with Johnson's Universal Cyclopædia and the Standard Dictionary. A complete list of his publications will appear in the current volume of the Bulletin of the Geological Society of America, through the kindness of Professor Wm. B. Clark.

As an investigator he was naturally influenced by the character of his environment, though his researches were in no sense limited or narrow. In a country where geological problems present themselves on every hand, it is likely that an investigator will attack those that are most accessible. And he will be fortunate if he finds himself in a region as diversified and interesting as that in which Professor Williams began his investigations. But while his work took color from its local surroundings, it was by no means confined to the borders of a limited area, or even of the state in which he lived. His interests and acquaintances in other parts of the country, his proximity to Washington, and his early connection with the United States Geological Survey enabled him to carry on his studies in distant places, and in this way to enlarge the field of his observation. Thus, while the major part of his work was prosecuted in Maryland, it extended into Virginia and North Carolina on the one side, and into Pennsylvania on the other. His researches in the Menominee-Marquette region of Michigan, and in the vicinity of Peekskill, N. Y., besides his travels through some of the most instructive regions of Western America, Canada, and Norway, further enriched his geological experience.

This wide range of opportunity furnished him material in part purely mineralogical, in part petrographical, and toward

the latter period of his career broadly geological. And while, by reason of the greater demands on his time of university duties, his earlier investigations lacked comprehensiveness, yet his treatment of whatever material was at hand was thorough and systematic, and his methods of presentation are models of logical arrangement and concise statement. Even his more fragmentary researches often contributed to the elucidation of principles of fundamental importance and of general application. Thus his study of some remarkable pyroxenes led him to the demonstration of the possibility of hemihedrism in the monoclinic crystal system; while his study of certain hornblende and its gliding planes contributed in no small degree to the proper crystallographic orientation of this mineral with reference to pyroxene.

In the realm of petrography he improved every opportunity, whether small or great, to advance the boundary and efficiency of this growing science. The accidental notice of an obscure body of serpentine in Syracuse, N. Y., long since buried by town improvements, and its investigation by modern microscopical methods, led to the complete refutation of the elaborate theory of Dr. T. Sterry Hunt, so far as it related to the chemico-sedimentary origin of this once well-known occurrence of serpentine. The identification of a glass-breccia, now metamorphosed, in the pre-Cambrian crystalline rocks of the Sudbury district, Canada, demonstrated the existence in this region at that geologically early date of volcanic action, whose products differed in no appreciable manner from those of modern volcanoes.

Soon after his establishment in Baltimore he began the study of the rocks of the neighborhood, selecting from among the crystalline schists those most closely allied to massive igneous bodies, and examining their transitions into more and more metamorphosed forms. In thus early attacking the problem of metamorphism he showed the influence of his environment, which received a powerful impetus from the work of Johannes Lehmann, published the year following, in 1884. This he eagerly assimilated, and, appreciating its great value, brought it to the notice



of his fellow countrymen in two reviews. Subsequently he received from Professor Lehmann a suite of specimens demonstrating the correctness of his conclusions, and by this means he became fully alive to the importance of similar methods of investigation for unraveling the complications of metamorphic rocks. This he expressed in his report on the Menominee-Marquette region in the following words: "The recent multiplicity of refined methods for the investigation of crystalline rocks, has opened an almost new field of geological inquiry. The difficult and obscure problems here presented may now be attacked by truly scientific methods. The prophecies which Hermann Vogelsang made in 1867 for the new departure in geology have been more than realized within the last twenty years. The almost new science of petrography may be said to have proved itself capable of rendering, in the study of the crystalline rocks, a service equal to that which palæontology has already given in the deciphering and correlating of the fossiliferous strata."<sup>1</sup>

Later his convictions as to the mission of petrology and the part it is to play in the advancement of geological science found expression in his address before the Worcester Polytechnic Institute, in which he said: "The recent development in the science of the earth consists of the return to the work begun by its earliest pioneers. The old petrographers were right. If we would know the life history of our planet, we must learn the origin, structural relations, and composition of our rocks. We must discover the forces—chemical and physical—which work in and upon them, and we must see *how* they work." Then catching inspiration from that eloquent advocate of the universality of life in matter, Professor John W. Judd, he adds: "It is a question how far the popularly received distinction between dead and living matter can be made amenable to strict definition as long as we know so little of what the so-called 'life force' is. As far as we can judge of the phenomena presented by the organic and mineral worlds, they differ rather in degree than in kind. . . .

<sup>1</sup> Bulletin 62, U. S. Geological Survey, p. 34.

There is, however, nothing among the recent discoveries of the microscope in regard to rocks so surprising as their delicate adjustment to their environment. We are accustomed to look upon the masses of our mountains as the very type of what is stationary and eternal; but in reality they are vast chemical laboratories full of activity and constant change. With every alteration of external conditions or environment, what was a state of stable equilibrium for atoms or molecules ceases to be so. Old unions are ever being broken down and new ones formed. Life in our planet, like life in ourselves, rests fundamentally on chemical action. The vital fluid circulates unceasingly through the arteries of the oceans and the currents of the air; it penetrates the rocks through the finest fissures and invisible cracks, as the human blood penetrates the tissues between artery and vein, producing, with the help of heat and pressure, like changes in the histology of the globe."<sup>1</sup>

The establishment of these convictions became the ruling motive of his later work. The more important of his petrographical studies include those on the gabbro and diorite in the neighborhood of Baltimore; on the massive rocks of the Cortlandt series in New York; and on the greenstone schists of the Menominee-Marquette region.

As his interests extended into the broader domain of general geology the scope of his investigations widened, and we find him at work on the petrography and structure of the Piedmont plateau in Maryland, and on the occurrence and distribution of the ancient volcanic rocks along the Atlantic seaboard. His work in coöperation with others on the geology of Maryland occupied a large share of his time in recent years, and appeared in various editions of the map of the state, the last of which is now in press.

In recognition of the value of his services to the Johns Hopkins University he was appointed Professor of Inorganic Geology, in 1892. The same year he was honored by the Geological Society of London by being made a foreign correspondent. He was one of the judges of award in the department of mineralogy at

<sup>1</sup> Popular Science Monthly, September, 1889, pp. 640-648.

the World's Columbian Exposition; and was a vice president of the Geological Society of America.

At the height of his effectiveness and in apparent vigor of manhood he was cut off—leaving the fields of his activity to other workers, and leaving us to mourn the loss of an illustrious associate, whose lovable character mellows the memory of his fruitful life.

Another day is ended.—A brilliant sun has set, illumining the clouds that would darken heaven with a vivid coloring, whose varied hues are but reflected fragments of the white light of noon.

JOSEPH P. IDDINGS.